JPL

Using “autogen” to Build Odyssey Mapping Sequences

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May 15, 2002

Contents

JPL

“autogen” Command Line Options

Command Option	Option Argument	R/O *	Description
-type	<sequence type>	O	The user specifies the type of sequence to be built. Defaults to "mapping" (no quotes).
-sc	<spacecraft number>	O	The user specifies the spacecraft id for which to build the sequence. Defaults to 53 (Odyssey).
-begin	<sequence begin time>	**R/O**	The user specifies the start time of the sequence if a FINCON is not specified.
-duration	<sequence duration>	**R/O**	The user specifies the duration of the sequence if the end time is not specified.
-end	<sequence end time>	**R/O**	The user specifies the end time of the sequence if the duration is not specified.
-config	<filename with path>	**R**	The user specifies the configuration file (and path, if not local) that is used to specify the parameters of the sequence build.
-ltf	<filename with path>	O	The user specifies the Lighttime file (LTF) (and path, if not local) to be used with this sequence. If not specified, the autogen script will search the PDB for the latest file that covers the time period in question.
-alloc	<filename with path>	O	The user specifies the Station Allocation File (SAF) (and path, if not local) to be used with this sequence. If not specified, the autogen script will search the PDB for the latest file that covers the time period in question.
-view	<filename with path>	O	The user specifies the Station View Period (VP) file (and path, if not local) to be used with this sequence. If not specified, the autogen script will search the PDB for the latest file that covers the time period in question.
-optg	<filename with path>	O	The user specifies the Orbit Propagation and Timing Geometry (OPTG) file (and path, if not local) to be used with this sequence. If not specified, the autogen script will search the PDB for the latest file that covers the time period in question.
-fincon	<filename with path>	**R/O**	The user specifies the filename (and path, if not local) of the Final Conditions (FINCON) file from which the sequence start time should be taken.
-apf	<filename with path>	O	The user specifies the filename (and path, if not local) of an APGEN Plan File (APF) that is desired to be merged in with the sequence build.
-h		O	The user specifies this if it is desired to see a short list of these options.
-x		O	The user specifies this option if it is desired to NOT build the sequence until the user has double-checked the input files for correctness in the APGEN environment file. The user can simply issue the "autogen <seq_id>" command to continue the sequence build after the initial run. This can be useful in cases where several files are retrieved from the FIS, and there is some question as to whether or not the auto-retrieval process will successfully identify all the correct data files.

* O = Optional, R = Required, R/O = Required if other “R/O”s not specified

Nominal Scenario

- Log in to a sequencing machine.
- Go to the regular directory for building sequences (type “ody-m”).
- Make a new directory for the new sequence (type “mkdir <seq_id>”).
- Copy an old config.apf to the local directory, calling it “<seq_id>.config.apf”.
- Update the “<seq_id>.config.apf” based on inputs from the mission planning meeting.
- Initiate the “autogen” script using the following command line:
  - autogen -begin <start time> -end <end time> -config <seq_id>.config.apf <seq_id>
- Quit APGEN by clicking on “File” then “Quit” and confirming.
- **Done!** The sequence has been built in the directory with the name “<seq_id>.sasf”.
- Utilize the “Sequence Product Generation Checklist” to build the uplink product, modifying the sequence, as needed.

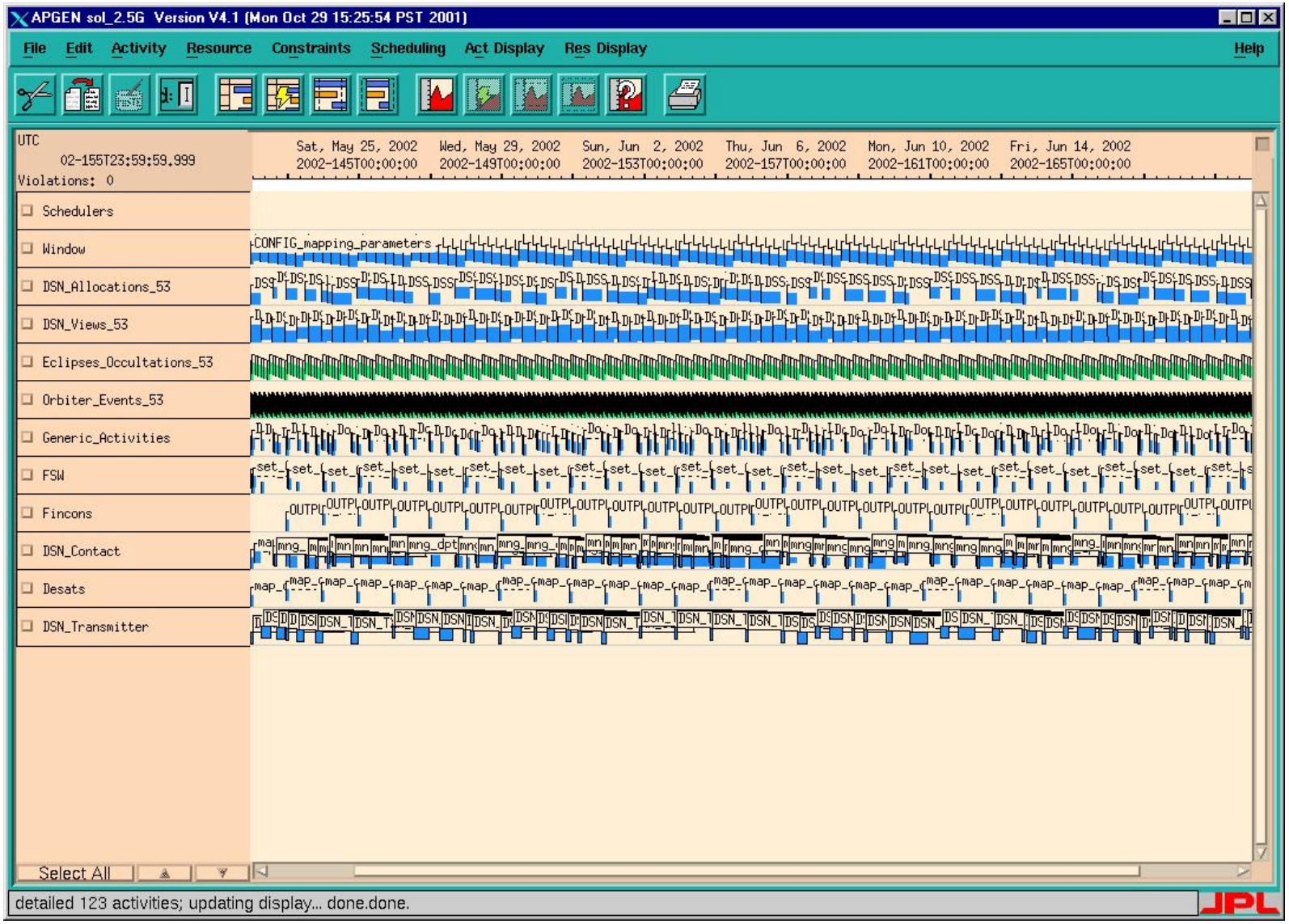
Nominal Scenario: Example "<seq_id>.config.apf"

```
apgen version "APGEN sol Version V2.1 (Tue Jul 14 13:36:34 PDT 1998)"
activity instance CONFIG_mapping_parameters of type CONFIG_mapping_parameters id CONFIG_mapping_parameters_1
    begin
        attributes
            "Start" = global_sequence_begin_time;
        parameters
            (
                # Reaction Wheel Desaturation Parameters
                                1,                              # scheduling strategy (1 = whole orbit, 0 = partial orbit)
                                11,                             # number of orbits between desats
                                1,                              # first orbit in the sequence for a desat
                                "Descending Node",              # event off of which the desats will be keyed
                                00:00:00,                       # duration that the desat will be offset from the key event
                                01:05:00,                       # duration to be passed to map_desat as start_timeout
                                00:25:00,                       # duration to be passed to map_desat as stop timeout (used for partial orbit)
                                00:05:00,                       # duration to allow for the HGA to reutrn to earth point
                # map_comm Scheduling Parameters
                                0,                              # scheduling strategy (1 = per orbit w/ offset, 0 = any possible time)
                                "Descending Node",              # key event after which to schedule map_comm block     (strategy 1 only)
                                01:18:00,                       # duration after key event to schedule map_comm block  (strategy 1 only)
                                01:44:28,                       # max duration of map_comm block transmission duration (strategy 1 only)
                                00:05:00,                       # minimum duration between map_comm blocks             (strategy 1 only)
                                00:00:20,                       # time for buffer to be emptied of sci data before going to nom_rt_only
                                00:11:00,                       # expected DSN lockup period
                                00:00:00,                       # navigation uncertainty to add to pad beginning of map_comm block
                                TRUE,                           # TRUE = schedule DSN supressions when on LGA
                # map_comm Block Inputs
                                48,                             # auto_rexmit_hours
                                00:05:00,                       # auto_rexmit_duration
                                FALSE,                          # sspa_off_flag
                # map_comm DPT Swap Parameters
                                TRUE,                           # TRUE = perform DPT swaps during map_comm block
                                00:02:00,                       # duration to lead Doppler mode change
                                00:11:00,                       # duration to wait for lockup after Doppler mode change
                                00:05:00,                       # Minimum science duration between DPT swaps
                # Downlink Rate Change Parameters
                                TRUE,                           # TRUE = schedule downlink rate changes per DSN station diameter
                                "39816_BPS",                    # downlink rate for 70 meter stations
                                "14220_BPS",                    # downlink rate for 34 meter HEF stations
                                "14220_BPS",                    # downlink rate for 34 meter BWG stations
                                "39816_BPS",                    # initial downlink rate at beginning of sequence
                # Daily Activities Parameters
                                TRUE,                           # TRUE = schedule FSW diagnostics
                                TRUE,                           # TRUE = schedule SCAM diagnostic
                                07:00:00,                       # time of day (ET) at which diagnostics will be performed
                                00:01:00,                       # delay between diagnostics
                                TRUE,                           # TRUE = schedule FINCONs
                                00:00:00                        # time of day at which FINCONs will be scheduled
                );
    end activity instance CONFIG_mapping_parameters
```

Nominal Scenario: Example <seq_id>.apgen.env

```
APGEN script version "APGEN"
#START_TIME: 2002-142T00:00:00.000
#CUT_OFF_TIME: 2002-170T00:00:00.000
#SEQUENCE_TYPE: mapping
OPENFILE cm011b.apgen.aaf
OPENFILE /msop/seq_rw/seq_config/engineering/MULTI.aaf
OPENFILE /msop/seq_rw/seq_config/engineering/53-MULTI.aaf
#
# Check the files below this line for correctness
#
# LIGHTTIME File: $PSS_INPUT_PATH/ltf/ltg_m_od01647-01656_02411_v1 converted to:
OPENFILE cm011b_ltf.apf
# SAF File: $PSS_INPUT_PATH/alloc/M01O_02141_02171B.SAF converted to:
OPENFILE cm011b_saf.apf
# VP File: $PSS_INPUT_PATH/vue/M01O_02092_05004.VP converted to:
OPENFILE cm011b_vp.apf
# OPTG File: $PSS_INPUT_PATH/optg/optg_m_od01647-01656_02411_v1 converted to:
OPENFILE cm011b_optg.apf
OPENFILE cm011b.config.apf
#
# Check the files above this line for correctness
#
OPENFILE cm011b.apf
REMODEL
REMODEL
SCHEDULEACTIVITY ID Schedule_Comm_Windows_1
DETAILALL
REMODEL
SCHEDULEACTIVITY ID Schedule_Daily_Activities_Manager_1
SCHEDULEACTIVITY ID Schedule_SPEC_Advisories_1
SCHEDULEACTIVITY ID Schedule_Orbit_Activities_1
DETAILALL
DETAILALL
REMODEL
SCHEDULEACTIVITY ID Schedule_Mapping_Comm_Activities_1
SCHEDULEACTIVITY ID Schedule_Downlink_Rate_Changes_1
DETAILALL
DETAILALL
REMODEL
SCHEDULEACTIVITY ID Schedule_DSN_Suppressions_1
SCHEDULEACTIVITY ID Schedule_DPT_Swaps_1
DETAILALL
DETAILALL
REMODEL
WRITESASF "cm011b.sasf" 2002-142T00:00:00.000 2002-170T00:00:01.000 "cm011b.sasf" 0
#QUIT
```

Nominal Scenario: Example APGEN Display



Example Command Lines

- Most Basic Command Line:

  autogen -begin 2002-142T00:00:00 -end 2002-170T00:00:00 -config cm011a.config.apf cm011a

- Pre-Build Command Line:

  autogen -x -begin 2002-142T00:00:00 -end 2002-170T00:00:00 -config cm011a.config.apf cm011a

- Specific Data File Command Line:

  autogen -begin 2002-142T00:00:00 -end 2002-170T00:00:00 -config cm011a.config.apf -alloc $PSS_INPUT_PATH/alloc/M01O_02141_02171B.SAF cm011a

What are all these files?

Filename Type	Generated By	Common Name	Description
<seq_id>.apf	Autogen	"The APF"	This file contains instructions for which types of commands to schedule. (This file is not usually used.)
<seq_id>.apgen.aaf	Autogen	"The AAF"	This file contains details about the sequence build itself, including the sequence boundaries and the sequence type.
<seq_id>.apgen.env	Autogen	"The APGEN environment file"	This file contains the instructions for APGEN as to *how* to build the sequence.
<seq_id>.apgen.log	APGEN	"The APGEN log"	This file contains a log of all the actions that APGEN makes.
<seq_id>.apgen.notes	APGEN	"The notes file"	This file contains any notes that may have been generated during the sequence build process.
<seq_id>.autogen.log	Autogen	"The autogen log"	This file contains a log of all the actions that the autogen script makes.
<seq_id>.config.apf	**User-defined**	**"The config file"**	**This is the common name of the user-specified file that contains parameters for how the activities should be scheduled.**
<seq_id>.files	Autogen	<none>	This file contains the results of the autonomous file search.
<seq_id>.sasf	APGEN	"The SASF"	This is the end result of the autogen process, the sequence itself.
<seq_id>_ltf.apf	Autogen	"The lighttime APF"	This is the pre-processed data file that contains the entries from the Lighttime file (LTF) that is applicable to this sequence.
<seq_id>_optg.apf	Autogen	"The OPTG APF"	This is the pre-processed data file that contains the entries from the Orbit Propagation and Timing Geometry (OPTG) file that is applicable to this sequence.
<seq_id>_saf.apf	Autogen	"The allocation APF"	This is the pre-processed data file that contains the entries from the Station Allocation File (SAF) that is applicable to this sequence.
<seq_id>_vp.apf	Autogen	"The view period APF"	This is the pre-processed data file that contains the entries from the Station View Period (VP) file that is applicable to this sequence.
seq_review.logfile	Autogen	<none>	This file contains a log of the actions of one of the pre-processing efforts.
seq_review.logfile.bak	Autogen	<none>	This file contains a backup log of the actions of one of the pre-processing efforts.

Other Useful Procedures (1)

- How do I know if the data files were correctly specified?
  - The "autogen" script builds a file with a filename of the form:
    - <seq_id>.apgen.env
  - Examine this file and look for the four important data types: SAF, LTF, VP, and OPTG. Check to see that these are correctly specified.
- It turns out that one of the data files was incorrectly specified. How do I get the right one?
  - All the data files are pre-processed by the "autogen" script and end up as files with a filename of the form:
    - <seq_id>_<type>.apf
      - where <type> = "ltf", "saf", "vp", or "optg" (no quotes)
  - First, delete the "bad" file (or move it to some other filename).
  - Then, locate the correct input data file.
  - And finally, use the strip_file_to_apf script, as follows:
    - strip_file_to_apf <type> <sequence begin time> <sequence cutoff time> <input filename with path, if not local> <seq_id>_<type>
  - For good measure, edit the <seq_id>.apgen.env file to indicate the right source file.
  - Done!

Other Useful Procedures (2)

- I used the "-x" option to check if the data files were correct and/or I may have needed to fix one of the input data files. How do I restart the sequence build process and/or rebuild the sequence?
  - Simply type "autogen <seq_id>".
    - The "autogen" script looks in the local directory for a file with the filename of the form <seq_id>.apgen.env, which is built by the "autogen" pre-processing. If it finds a file like this, it skips all the pre-processing steps and proceeds to initiate APGEN, which acts upon the instructions within this file.
- I'd like to rebuild my sequence, but I don't want to see the APGEN GUI.
  - Edit the file with the filename of the form <seq_id>.apgen.env to remove the number sign ("#") from in front of the "QUIT" in the last line of the file.
  - Then simply rebuild the sequence by typing "autogen <seq_id>".

Typical Problems (1)

- Invalid inputs on command line:
  - Data files that are specified by name on the command line must be resident in the local directory or have the path specified along with the filename.
    - There are no restrictions on the path name as long as the files are available on the local machine.
    - The filenames MUST be spelled correctly (this is a “no-brainer”, but often a gotcha!).
    - Any entry specified on the command line should NOT have quotes around it.
  - The user should ensure that the environment variable “FIS” is set to “OPS” (or “TBD” if using the testbed).
    - Use the command line “setenv FIS OPS” to fix it.
  - If the script terminates early, it is designed to indicate what inputs are needed or incorrectly specified.

Typical Problems (2)

- Autonomous file searches failed:
  - An error appears on the screen indicating that a data file can not be found that spans the entirety of the sequence duration:
    - This occasionally happens as some data files may end slightly earlier than the sequence end time.
    - Look in the generated file "<seq_id>.files" to see if the input files in question are correctly specified.
      - If correct, then there's nothing to worry about.
      - If incorrect, find the right one and use the "strip_file_to_apf" script, as mentioned earlier.
    - If the file in question was specified on the command line, don't worry about this.
  - An error appears on the screen indicating that a data file can not be found that spans the entirety, or even a part, of the sequence duration:
    - The autonomous file search completely failed to find a data file spanning the sequence boundaries.
    - This results in a generated, pre-processed data file (the files of name: <seq_id>_<type>.apf) being of file size zero.
    - Use the "strip_file_to_apf" script, as mentioned earlier, to get the right file.
    - If the file in question was specified on the command line, don't worry about this.

Typical Problems (3)

- The resulting SASF does not have expected commands in it:
  - Most likely reason: The user should check the "<seq_id>.apgen.env" file to ensure that all of the input files are correct and make corrections, if needed.
  - Less likely reason: The scheduling algorithms are not working properly. Contact the "autogen" developer for help.
- The error "Nothing to Detail" appears in the GUI.
  - This often occurs when the conditions were not right to schedule a class of activities. Generally, it is nothing to worry about, though it may be an indicator of the following:
    - The user decided not to schedule a class of activities (via the "config" file).
    - Something did not schedule correctly.
      - Check the SASF for completeness.

Typical Problems (4)

- Bad attempts to re-build a sequence
  - If a user attempts to rebuild a sequence of the same sequence name in the same directory as an old attempt, the rebuild may not occur properly.
    - The autogen script searches for a file named "<seq_id>.apgen.env". If this file exists, it will build the sequence using this pre-existing environment file and will NOT do any of the expected pre-processing.
    - The user should start in a "clean" directory for each sequence build and/or ensure that there is not a "<seq_id>.apgen.env" in the directory in which the sequence will be built.

Things NOT to Do

- Don't try to save anything from the APGEN GUI.
  - The "autogen" scripting saves everything that is necessary. An inexperienced user can make quite a mess of the data files in the local directory if any attempt is made to save files via the GUI.
- Don't try to schedule things directly through the GUI.
  - The "autogen" approach sets up a particular environment within which APGEN can schedule the activities. An inexperienced user will have little luck scheduling new commands via the GUI (though it certainly IS possible). Generally, it is easier to manually edit the resultant SASF to add in the new commands.
- Don't assume that the scheduler is perfect.
  - It rarely is.
  - It is not uncommon for manual changes to be necessary.

Troubleshooting Procedure

- Read the first few lines of the "<seq_id>.autogen.log" to ensure that the command line was correct. (Most problems will be caused here.)
  - Check for bad filenames
  - Try to identify any missing or bad inputs
- Check the "<seq_id>.apgen.log" and the "<seq_id>.apgen.notes" for any errors or warnings.
- Read the entirety of the "<seq_id>.autogen.log" to check for any unusual entries.
- Call for help.

Final Word

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- 95% of the problems will be because the user failed to correctly specify the inputs on the command line or the input files are missing or incorrect!

- The other 5% of the problems will be because the scheduling algorithms or the "autogen" script doesn't exactly reflect the user's desires.
  - (The typical "Hey, guys, it only does what you tell it to do . . ." syndrome.)

- And remember, if all else fails, call for help!